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21st Century Teenagers and Young Adults who are Deaf or Hard of Hearing: Outcomes and Possibilities

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Abstract: The purpose of this study was to document demographics, characteristics, and long-term outcomes of teenagers and young adults who are deaf or hard of hearing (DHH) and who all attended the Moog Center for Deaf Education for preschool and/or a portion of elementary school. Because it is not an experimentally controlled study, it does not establish causal relationships among outcomes and variables describing the intervention program or the participants. It does provide valuable data about the possibilities for children who are deaf or hard of hearing and identifies variables associated with positive outcomes that can be more closely examined in future experimentally controlled studies. Data were obtained via an online survey from 108 individuals who were DHH and had attended the Moog Center for Deaf Education. The survey assessed educational, employment, and personal outcomes of individuals who were currently in high school and beyond (15–32 years of age). Results indicate this group of individuals obtained high levels of achievement in terms of educational attainment, employment experience, social involvement, and communication competence.

Key Words: deaf education, listening and spoken language intervention, long-term outcomes, teenagers and young adults who are deaf or hard of hearing

Acronyms: CART = Communication Access Real-time Translation; CI = cochlear implant; DHH = deaf or hard of hearing; EHDI = early hearing detection and intervention; HA = hearing aid; IDEA = Individuals with Disabilities Education Act; PTA = pure tone average; SLP = speech-language pathologist; TOD = teacher of the deaf

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Over the past 25–30 years, several important changes in technology and public policy have resulted in a monumental shift in the education of children who are deaf or hard of hearing (DHH) and dramatically increased the potential outcomes and opportunities for these children. Changes in technology include advancements in hearing technology, and information and communication technologies. Changes in public policy include federal laws such as the Early Hearing Detection and Intervention (EHDI) Act of 2017 and the Individuals with Disabilities Education Act (IDEA, 2004).

1. Advancements in hearing technology in both hearing aids and cochlear implants have dramatically increased access to sound for individuals who are DHH. In addition, the age at which the FDA approved implantation of cochlear implants has decreased from the initial candidacy criteria of 18 years in 1984, two years of age in 1989, and one year of age in 2000 (Sorkin, 2016).

2. Computers, captioning, social media, and other internet technology have expanded the ways in which individuals communicate and access information that have affected the lives of all individuals, with potential long-term benefits for individuals who are DHH.

3. Early Hearing Detection and Intervention (EHDI) programs have reduced the average age of identification of hearing loss. Prior to the 21st century, most children who were DHH were not identified until they were two to three years of age when parents noticed they were not talking (Toward Equality, 1988; White, 2014). Earlier identification has resulted in earlier intervention and earlier fitting of hearing aids (Harrison, Rousch, & Wallace, 2003;

Hoffman & Beauchaine, 2007). EHDI programs now exist in all 50 states with the purpose of ensuring that all infants are screened for hearing and that those identified with hearing loss are enrolled in early intervention as soon as possible. This has reduced the average age of identification of hearing loss by more than two years, to an average of three to six months (White, 2014). Additionally, the Centers for Disease Control and Prevention (CDC, 2018) reports 98% of all infants are now screened for hearing loss.

4. Individuals with Disabilities Education Act (IDEA) is a law that ensures that eligible students with a disability are provided with a free appropriate public education and related services that are tailored to their individual needs (IDEA, 2004).

As a result of these changes, opportunities for the current generation of teenagers and young adults who are DHH have exceeded those of past generations. Even as opportunities continue to expand, parents remain concerned about outcomes for their children (Szarkowski & Brice, 2016). Ninety-five percent of children who are DHH have at least one hearing parent (Mitchell & Karchmer, 2004). Research suggests that hearing parents of children who are DHH experience unique concerns (Hintermair, 2006; Pipp-Siegel, Sedey, & Yoshinaga-Itano, 2002). When hearing parents first find out that their child has a hearing loss, they are concerned about their child's future (e.g., Will my baby have friends? Be involved in sports? Go to college? Get a job?). EHDI service providers are often the first points of contact for new parents of children who are DHH, and parents look to them to answer these questions and express what can be expected for their child. Longitudinal outcome data are needed to answer these questions for the current generation of children who are DHH.

The current study begins to address those questions by describing the educational, employment, and related outcomes for 108 alumni from the Moog Center for Deaf Education. Because it is not an experimentally designed study, it does not establish cause and effect relationships among outcomes, children's characteristics, and the type of interventions they received. The study nonetheless provides valuable information about what is possible in the 21st century for children who are DHH.

The Moog Center is a listening and spoken language program for children who are DHH. All participants attended the Moog Center for a portion of their early education, including preschool and/or elementary school. Study participants ranged in age from 15 to 32 years at the time data were collected. To the authors' knowledge, this is the first longitudinal description of outcomes for teenagers and young adults who are DHH, in which all participants had attended the same deaf education program prior to entering a general education setting with their hearing peers. The information in this article helps to fill the gap in the deaf education literature about longitudinal outcomes for children who are DHH after controlling for educational environment and instructional philosophy.

Method

This study received approval from IntegReview Institutional Review Board, Austin, TX (#201516). All individuals ages 15 and older at the time data were collected and who attended the Moog Center for at least one year were eligible to participate in the study. Data for this study were obtained from two sources: (a) the Moog Center's in-house database, and (b) an online survey created by the Moog Center's founding director. The in-house database contained historical data on each participant, including contact information, demographics, and audiological histories. The online survey, via Survey Gizmo, was designed to collect information about participants' educational, employment, and personal experiences in high school, higher education, and beyond.

Young adult participants, 18 years and older, were contacted via an email invitation. Teen participants were recruited by parental phone call and parental consent to contact the participant via a parent-provided email address. Contact information for alumni and parents of alumni was obtained from the school's database and social media. Email addresses for ten of 132 eligible alumni could not be procured, and four parents of high schoolers declined to consent for their children to participate, resulting in 118 emailed invitations to alumni for participation in the online survey.

The email contained a brief description of the study, including what the researchers hoped to learn, what would be expected for participation, an estimation of how much time the survey would take, and information about a compensation of $50 for participants who completed the survey. The email also contained a link to the survey, and the first page of the survey contained the consent form for participating. Of the 118 alumni to whom surveys were sent, 108 (92%) consented to participate and completed the survey.

Survey questions inquired about education, employment, communication, use of technology, special recognitions received, and other aspects of the participants' lives after leaving the Moog Center. The survey was composed mostly of multiple-choice questions with a few open-ended questions. The survey used skip logic, a feature that leads participants through the survey based on their previous answers.

Participants

Of the 108 participants, 92% were identified with hearing loss before three years of age, and the remaining 8% were identified before five years of age. All participants met the following criteria: (a) attended the Moog Center program for at least one school year during preschool and/or elementary school, and (b) were above the age of 14 at the time of the study. The 108 respondents were divided

into two groups: (a) 44 high schoolers, henceforth referred to as Teens, and (b) 64 alumni who were beyond high school, henceforth referred to as Young Adults. Table 1 summarizes the characteristics of participants.

Table 1
Participant Characteristics

Attribute	Description	Teens *n* = 44	Young Adults *n* = 64	All Participants *N* = 108
Unaided PTA Better Ear	Pure tone average, mean thresholds in dB and range	90.6 (38.6 – NR)	98.3 (55 – NR)	95.2 (38.6 – NR)
Hearing Technology	Number with:			
	1 CI, no HA	8	32	40
	2 CI	18	17	35
	1 CI, 1 HA	9	7	16
	2 HA	9	8	17
Deaf of Deaf	*n* and % with parents who are DHH	1, 2%	3, 5%	4, 4%
Mother's Education	*n* and % with mothers who obtained degrees from higher education institutions	33, 75%	51, 80%	84, 78%
Performance IQ	Mean nonverbal intelligence quotient and range	112 (90–129)	107 (79–133)	109 (79–133)
First Amplification	Mean age in years at first hearing aid fitting and range	1.5 (0.2–4.5)	1.6 (0.1–5.0)	1.6 (0.1–5.0)
First Implant	Mean age in years at first cochlear implant and range	3.0 (1.0–7.8)	5.7 (1.8–25.0)	4.7 (1.0–25.0)

Note. NR = No Response at the limits of the audiometer; PTA = pure tone average; CI = Cochlear Implant, HA = hearing aid; DHH = deaf or hard of hearing.

Hearing Technology

On average, participants first received hearing aids by 18 months of age and 91% were amplified before three years of age. When asked about present-day use of hearing technology, 84% of participants reported use of at least one cochlear implant, and 16% reported wearing bilateral hearing aids. Among CI users, 41% of Teens and 27% of Young Adults reported bilateral implantation. More Teens (41%) than Young Adults (27%) were bilaterally implanted. All but one participant, who received his CI at age 25, responded that device(s) were worn most or all waking hours, excluding inappropriate times such as swimming, taking a shower, and/or sometimes in noisy places.

Preschool and Elementary Education

The Moog Center curriculum is based on a curriculum developed by Jean Moog during the Experimental Project in Instructional Concentration (Moog & Geers, 1985). The teens and young adults surveyed for this article were taught using this curriculum and it is still used today. The Moog Center provides a full-day spoken language program for preschool and elementary school children who are DHH. The program is intensive, focused, and objective-driven. The two main components of the Moog Center programs are small-group instruction and large group instruction. Additionally, parent informational group meetings, parent support group meetings, and individual parent-child coaching sessions are available. Preschool children spend about half of the day in small groups for individualized therapy and the other half of the day in large groups. Small groups typically consist of two or three children with similar abilities in each spoken language area, including speech, vocabulary, language, and auditory skill development. Small groups allow for explicit instruction in each of these skills. For children in preschool, large groups typically consist of eight to twelve children in a classroom where the focus is on the development of motor skills, social skills, pragmatic skills, and preschool academic skills. The larger preschool classroom setting also provides natural opportunities for children to transfer specific learned spoken language skills to conversational settings in the context of preschool activities. Children in the elementary school program have a similar schedule for small group instruction for spoken language and reading development; medium sized groups of four children for elementary subjects such as written language, math, science, social studies, and critical thinking; and large groups of 8–12 for special activities, computers, centers, and physical education. Throughout the day, children in both the preschool and elementary school programs alternate between small and large group activities. Appendix A details sample daily teacher/learner schedules for both programs. Teaching staff include certified teachers of the deaf, speech-language pathologists, and early educators.

Audiology services are provided onsite by experienced pediatric audiologists for all school children. These services include objective and behavioral hearing evaluations, fitting and programming of hearing aids, cochlear implants, and remote microphone technology. In addition, aided assessments, including speech perception testing, are routinely performed to maximize audibility and ensure consistent, optimized access to sound.

Results

Preschool and Early Elementary Education

Table 2 describes participants' early elementary education. The majority (78%) of participants enrolled in the Moog Center program before age five years. Of these, 50% entered between ages one month and three years and another 28% entered between ages three and five years, with the remaining 22% entering after age five years. Ninety-two participants (85%) entered general education settings with typically hearing peers after leaving the Moog Center. The remaining 15% continued education in other specialized settings, including listening and spoken language programs, special education classrooms, and one in a homeschool setting. The average age upon entering general education settings was significantly different for Teens and Young Adults, with the Teens

entering an average of more than two years earlier than the Young Adults.

Table 2
Description of Early Education

Attribute	Description	Teens *n* = 44	Young Adults *n* = 64	All Participants *N* = 108
Entry to the Moog Center	Mean age and range in years at entry to the Moog Center	2.9 (0.3–5.9)	3.6 (0.4–9.3)	3.4 (0.3–9.3)
Exit from the Moog Center	Mean age and range in years at graduation from the Moog Center	6.8* (3.6–9.6)	8.8* (4.1–12.9)	8.0 (3.8–12.9)
Time spent at the Moog Center	Mean number and range of years spent at the Moog Center	3.8 (1.6–8.6)	5.2 (0.9–10.6)	4.6 (0.9–10.6)
Entry to general education setting	Mean age and range in years at entrance to a general education setting	6.7* (4.2–9.2)	8.9* (5.2–12.9)	8.0 (4.2–12.9)

*$p<0.01$

High School and Post-Secondary Education

All 64 Young Adults (100%) were high school graduates. Four of these (6%) stopped their formal education after high school and obtained full-time employment. The other 60 (94%) attended a post-secondary education program, as described in Figure 1. Six were currently attending graduate programs, while seven had obtained graduate degrees. Thirty-nine different college and universities were attended (see Appendix B for complete list).

One hundred survey respondents (93%) participated in sports and/or clubs during their high school and college years. Forty-three respondents (40%) participated in more than one sport, and 21 (19%) reported being in leadership positions and/or achieving special recognition, such as being team captains and team managers. Twenty varieties of athletic teams were included among the participants' survey responses. Sixty-four of the respondents participated in organized clubs while attending high school, and 23 varieties of clubs were included among the responses, including social, service, language, STEM, pre-professional, and leadership organizations. In addition to these activities, seventy-two participants (67%) reported receiving awards and special recognition such as prestigious academic awards, athletic recognition, and honors such as valedictorian and commencement speaker. Among Young Adults in college, 12 received academic scholarships, one graduated Cum Laude, one Magna Cum Laude, and one Summa Cum Laude. A full list of awards and clubs can be found in Appendix C.

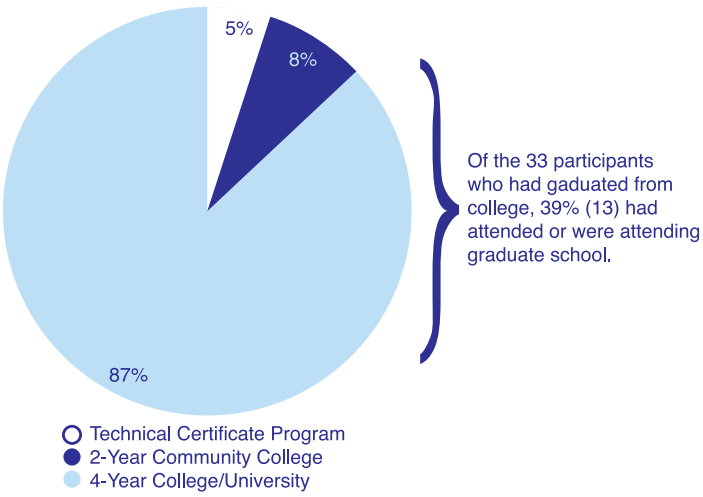

***Figure 1*. Post-secondary programs attended.** Three of the 60 attended a technical certificate program and stopped at that level or were still attending at the time of the survey. Five (8%) attended a 2-year college program and stopped at that level or are still attending. Fifty-two (87%) were currently attending or had graduated from a 4-year college/university. Of the 52, 33 (63%) had graduated, and 19 (37%) were currently attending. Of the 33 college graduates, 13 (39%) went on to attend graduate programs.

While attending high school, 101 (94%) participants accessed at least one support service, and of those in post-secondary programs, 100% accessed at least one service. In both high school and post-secondary programs, many students accessed multiple services. Figure 2 details the services accessed by survey respondents during their high school and post-secondary programs.

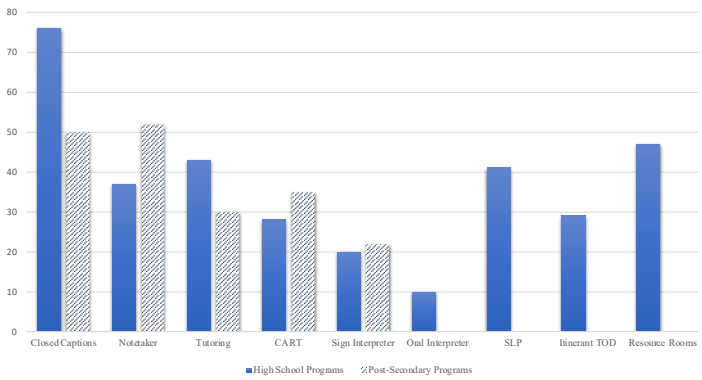

***Figure 2*. Support services accessed by participants in high school and post-secondary programs.** Support services included closed captions, designated notetakers, tutoring services, Communication Access Real-time Translation (CART), sign language interpreters, oral interpreters, speech-language pathologists (SLPs), itinerant teachers of the deaf (TODs), and resource rooms.

Employment

Among the 64 Young Adults (i.e., those beyond high school), 24 were still attending post-secondary programs or graduate schools. Of those, 14 had jobs, including teaching assistant, retail sales positions, child care provider, online boutique entrepreneur, and other jobs typical for students working while in college. Thirty-nine of the Young Adults were no longer in school. Of these, 32 (82%) were employed, 21 in full-time jobs and 11 in part-time jobs. Areas of employment included 18 in business, six self-employed, four in education, one in government, and three in other areas. Salaries were commensurate with salaries of hearing peers.

For those out of school and working full-time, 18 of the 21 respondents (86%) reported being extremely satisfied or very satisfied with their current job. Participants were also

asked to indicate which of the following statements applied to their present employment (numbers in parentheses indicate the percentage of respondents who checked each of the statements):

- My skills are well-utilized in my employment (86%).
- My current employment offers prospects for further advancement (65%).
- Being competent in spoken language is important to my job (60%).
- My employment fits my long-term goals (53%).
- I would like to remain with my current employer for the foreseeable future (53%).
- I plan to remain in my current occupation for the foreseeable future (46%).
- During college, I had an internship, a cooperative education assignment, or field experience (including student teaching) related to my present employment (46%).
- During college, I had a part-time or summer job related to my present employment (37%).
- I supervise two or more people (26%).

Communication

The survey participants were asked to assess their speech intelligibility and comprehension when talking with:

1. Very familiar people, such as immediate family members, teachers, friends at school, and other close friends.
2. Less familiar people, ones you see once or twice a month, such as grandparents, cousins, aunts/uncles, neighbors, friends.
3. Someone who has very little experience talking to people who are DHH, such as a cashier in a store or a waitress at a restaurant.

Possible responses were (a) *completely understood*, (b) *mostly understood*, (c) *barely understood*, or (d) *not understood at all*. Table 3 summarizes the participants' assessment of their success in communicating face-to-face using spoken language.

In response to being understood when talking with very familiar people, 97% of participants responded, completely or *mostly understood*. In response to being understood when talking with less familiar people, 96% responded *completely understood*. With people who have little interaction with individuals who are DHH, 87% responded *completely* or *mostly understood.*

Participants were also asked, "How well do you understand when they talk to you?" In relation to very familiar people, 94% responded *completely* or *mostly understood*. With less familiar people, 88% responded *completely* or *mostly understood*. When talking to people who have little interaction with individuals who are DHH, 69% responded *completely* or *mostly understood* and 31% responded they understood about half or less than half of what the speaker said.

In response to the question, "How do you communicate with your friends and family?" participants were provided options and asked to check all that apply. Figure 3 illustrates the options offered and the percentages reported for each.

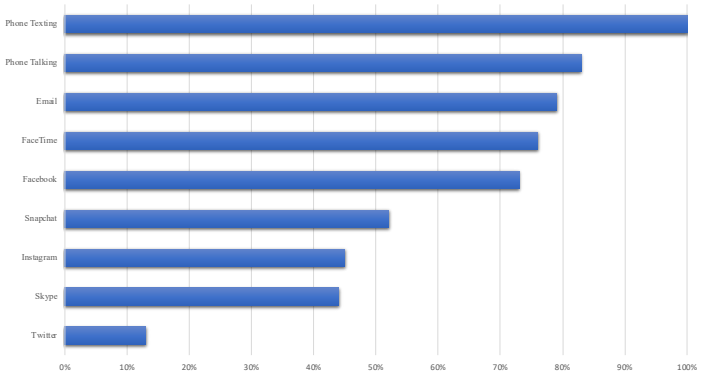

***Figure 3*. Communication Using Technology.** Respondents were asked, "How do you communicate with your friends and family?" The responses are divided into different types of technological communications. Respondents were asked to check all options that apply and percentages are reported for each option used.

Table 3
Spoken Communication Competence

	How well are you understood when you talk?			How well do you understand when others talk to you?		
(*N* = 108)	With very familiar people	With less familiar people	With people who have little interaction with those who are DHH	With very familiar people	With less familiar people	With people who have little interaction with those who are DHH
Completely understood	70	56	54	51	34	22
Mostly understood	35	48	40	51	61	52
About 50% understood	2	1	12	5	10	28
Barely understood	0	2	1	0	1	4
Not at all understood	0	0	0	0	1	1
No survey response	1	1	1	1	1	1

Participant Reflections

Open-ended questions in the survey provided opportunities for participants to express what they considered to be their accomplishments and to reflect on other aspects of their lives. Two of the survey's open-ended items were: (a) *What are you most proud of since you left the Moog Center?* and (b) *Please comment about anything else you would like to share with us*. Major themes that emerged from both Teen and Young Adult responses included accomplishments such as educational attainments (43%), competence in communicating (49%), community involvement (32%), employment (25%), and academic honors received in high school and college (12%). Other topics included personal competencies that had been important influences in participants' lives, such as self-confidence, motivation, and determination. Participants also reflected on their Moog Center education, support of family and friends, hearing technology, and advice for parents. Verbatim responses from Young Adult participants can be seen in Table 4 and from Teens in Table 5. Additional reflections are presented in Appendix D.

Table 4
Young Adult Reflections

What are you most proud of since you left the Moog Center?	"My college degree, getting the job offer at my dream agency and marrying a wonderful man. All in one year. Besides that, I'm also blessed that I have the ability to advocate for myself, embrace challenges, as well as the motivation to never give up."
	"Becoming one of the first in the country with a cochlear implant to become an Emergency Medical Technician (One of the requirements is that you have to [have] "complete hearing") – and obtaining a 2nd Bachelors' degree in nursing from [X] University."
	"I graduated with a 3.8 GPA from [X] University and have [been] steadily employed and promoted [in my career]. I lead daily and weekly meetings in person and via phone."
	"I am successful in my career as an Account Executive, managing the [X national corporation] e-commerce account. I am very proud of where I am today, and I love teaching my coworkers about what it means to be deaf. Everyone is genuinely curious about my hearing impairment, the cochlear implant, how I was able to learn to speak so well, etc."
Please comment about anything else you would like to share with us.	"If there's anything someone tells you or to your child, "It can't be done." Use that as your motivation and power to drive you or your child to accomplish it. Nothing is impossible and there are no limitations...If there is a will, there is a way."
	"While my speech is not flawless, it is effortless…Moog gave me the tools I needed to succeed in this world."
	"I couldn't have come so far in life without all the help and support you provided early on."
	"The therapy and training I've received at Moog laid down the foundation for the rest of my life. It's made me learn to ask for help, to never stop practicing nor stop learning."

Table 5
Teen Reflections

What are you most proud of since you left the Moog Center?	"Knowing how to talk to people and learning how to keep up in class."
	"My ability to excel in nearly all areas of my life; having close friends and being social, participating in sports and being athletic, all the while being academically one of the top in my class."
	"I have signed to play baseball at [X] University. I have made honor roll every semester. I am at the top of my class."
	"I am most proud of my ability to speak and interact with hearing people. I fit right in at my mainstream school. I can socialize very easily."
Please comment about anything else you would like to share with us.	"My cochlear implant has helped to give me a great amount of success in the world, and I'm very thankful for that!"
	"High school has been difficult for me because of the demands of the classes, but I have really pushed through it and am proud of that. I'm also thankful of the support that my family and friends gave me."
	"If you have a deaf child or hard of hearing child that would like to involve into some kind of sports or any of the activities, then parents should let them do what they love."
	"Being a student at Moog has made a huge impact on my life, not only did I learn to speak clearly, but I gained self-confidence and learned how to advocate for myself. I'll never forget my wonderful teachers, and I love my audiologists."

Discussion

Preschool and Elementary Programs

The Moog Center is a non-profit independent center that provides a full-day listening and spoken language preschool and elementary school program for children who are DHH. On average, tuition for 40–50% of the children is supported by their home school district. For those who do not receive school district support, financial aid is available through the Moog Center's Scholarship Fund. The Scholarship Fund is provided on a sliding scale to all families who qualify, so no family is turned away based on ability to pay.

The daily teacher/learner schedule, a signature element of the Moog Center, was adapted and updated from the program organization and teaching strategies developed during the Experimental Program in Instructional Concentration (EPIC) Project (Moog & Geers, 1985). Modeling and Imitation was the overall teaching strategy used in activities throughout the day, as explained in Appendix E. Sample morning schedules for preschool and elementary school programs, as well as the rationale, are more fully described in Appendix A.

Access to Technology and Entrance to General Education

Advances in hearing technology, early identification, and educational support services provided by IDEA meant that all of the children in the study had access to sound during their preschool years. Access to sound was thought to be an important factor in preparing children to enter general education programs during their elementary school years. The fact that Young Adults (8.9 years) entered general education more than two years later than Teens (6.7 years) may reflect the generational advantage provided to the younger population. Advantages included continuing improvements in hearing aids and cochlear implants, which likely contributed to the development of good spoken communication as reported by participants, documented in Table 3. It is likely that being included in educational settings with hearing children for most of elementary school would have helped prepare all of these individuals to develop strong self-confidence and form friendships with hearing peers.

As depicted in Figure 2, the technology of closed-captions, CART (Communication Access Real-time Translation), and other support services provided through IDEA were accessed to some degree by all participants. Such technological supports probably made accessing the general education curriculum easier and more complete throughout their education and may account, at least in part, for their academic success and high level of educational attainment.

There was virtually no difference between Young Adults and Teens in mean age of receiving their first hearing aids (1.6 years for Young Adults and 1.5 years for Teens). This is surprising since the average age of identification of hearing loss prior to the 21st century was two to three years (Harrison et al., 2003; Hoffman & Beauchaine, 2007). Young Adults in the current study were born between 1984 and 1998, which was before Congress passed the Newborn and Infant Hearing Screening and Intervention Act of 1999. On the other hand, unsurprisingly, there was a two-year difference between the groups in terms of receiving cochlear implants. The FDA age of approval for cochlear implants decreased from 18 years of age and older in 1984, to two years of age and older in 1989, and finally for children as young as one year of age in 2000. During the time the participants in this study were growing up, improvements in hearing technology provided increased access to sound, resulting in improved ability for perceiving speech and for developing high speech intelligibility. These improvements in hearing technology, as well as the younger age at which Teens received their cochlear implants, could easily have contributed to making it possible for the younger group to join general education settings two years earlier than the older group.

Participation in High School Sports and Other Activities

Several studies of teenagers who have typical hearing have found that being involved in extracurricular activities in high school is beneficial in a variety of ways, such as growing up to be more successful in communication and developing stronger relationships (Mahoney, Cairns, & Farmer, 2003; Guèvremont, Findaly, & Kohen, 2014). Research including students with disabilities involved in extracurricular activities shows that they were more likely to have friends and be engaged in relationships than those who were not (Pence & Dymond, 2016).

An important component of adolescent and young adult development is the degree to which one feels a sense of belonging within a community of peers. In a study using data from the National Longitudinal Study of Adolescent Health, Feldman & Matjasko (2005) reported that 70% of American adolescents were involved in some form of extracurricular activity. In the current study, 93% of respondents reported that they participated in sports and/or clubs in high school and college—a substantially higher rate of participation than that reported for their hearing peers. Not only did almost all Moog Center alumni participate in high school activities, but 18% attained leadership roles as captains and managers of sports teams, leaders in clubs, and elected officers in student government. It is likely that participation in high school activities had a positive impact on their high school experiences, building their self-confidence, developing relationships, learning how to work with others, and feeling comfortable with their hearing peers.

Educational Attainment

According to a recent study of the National Deaf Center (NDC) on Post-Secondary Outcomes of Young Adults 18 to 25 years who identify as DHH, 27% were enrolled in post-secondary education and training programs, compared to 39% of hearing individuals (Garberoglio,

Cawthon, & Sales, 2017). Of the 64 Young Adults in the current study, 100% graduated from high school, 94% of them attended, are attending, or have graduated from post-secondary programs, and 39% of college graduates are attending or have received degrees from graduate programs, as detailed in Figure 1. These high levels of educational attainment of Moog Center alumni exceed the educational attainment for both deaf and hearing individuals as reported by Garberoglio et al. (2017). The 39 diverse college programs attended by these participants are listed in Appendix B.

Employment

The wide areas of employment in which the current study's survey participants were engaged indicated the range of interests, skills, and opportunities that were available to the participants in this study. The majority of those employed full time (89%) reported high satisfaction with their current employment. In addition, over half of the respondents reported that their current employer offers prospects for further advancement, being competent in spoken language is important to their job, and their skills are well-utilized in their employment.

Communication

As detailed in Table 3, participants reported having some difficulty understanding individuals who had little experience talking with people who are DHH. A possible explanation for greater difficulty in understanding speakers, such as clerks in stores, servers in restaurants, and others who rarely interact with people who are DHH, is that these people may talk too fast or not clearly enunciate. Another possible explanation may be that places such as stores, restaurants, and other public places are noisy environments, making hearing and understanding more difficult for individuals who are DHH.

In response to survey questions asking participants to rate their level of success in communicating using spoken language, almost all (96%) rated themselves as being competent when communicating with familiar people, both in being understood and in understanding the speaker. When communicating with familiar people, virtually all (more than 96%) of participants rated themselves as competent in communicating with familiar people with whom they have ongoing contact.

The communication opportunities created by the ever-expanding social media technology, such as email, texting, captioning, Skype, Snapchat, Facebook, and Twitter, have transformed social communication, as documented in Figure 3. These technologies have enabled participants to be in touch with their families and friends, both hearing and deaf, across the country and the world. In addition, the technology of captioning has given people who are DHH, including those that focus on listening and spoken language, better access to TV and movies, which has expanded opportunities to enjoy these activities with both their hearing and deaf friends as well as their families. Many of the participants commented that they use technology to develop social relationships and to feel and stay connected. This kind of access had become increasingly available as these individuals were growing up in contrast to earlier times when people who were DHH were dependent on Relay, TTYs, and snail mail for communication that was not face-to-face.

Participants' Reflections

In the responses to open-ended questions at the end of the survey, as detailed in Tables 4 and 5 and Appendix D, participants expressed important thoughts about themselves and various other aspects of their life experiences not addressed in the previous multiple-choice survey items. The question *What are you most proud of?* provided an opportunity to reflect on their accomplishments and provided insight about what participants strove for and were proud to have accomplished. Accomplishments cited included levels of educational attainment, academic awards, participation, and leadership in clubs and sports in high school and college, as well as success in employment. Especially enlightening were the responses to the very open prompt, *Comment on anything else you would like to share.* In their comments to this request, it was clear that many had set high expectations for themselves, had learned that hard work pays off, had become self-confident, and had acquired other personal competencies such as high motivation, determination, persistence, and ability to communicate and advocate for themselves. Hintermair and colleagues, in a study of adults who were DHH and who considered themselves successful in their jobs, found that the participants in their study reported similar social and personal competencies as being important contributors to their success in their jobs (Hintermair, Cremer, Gutjahr, Losch, & Strauß, 2018).

Conclusion

The results of this study demonstrate that teens and young adults who are DHH in the 21st century can be very successful with respect to education, employment, and related outcomes—much more so than has historically been the case for individuals who were DHH. Although it is reasonable to conclude that these Young Adults and Teens benefitted from public policy changes, technology advancements, and early education in an intense, focused intervention program, the descriptive nature of the data preclude being able to make such causal conclusions.

Regardless of what factors contributed to the outcomes documented in this study, it is clear that the overall level of achievement in educational attainment, employment, and general satisfaction with their lives is greater for the participants in this study than has been typically reported in previous studies of teenagers and young adults who are DHH (e.g., Dammeyer & Marschark, 2016; Garberoglio, Cawthon, & Bond, 2016; Garberoglio, Cawthon, & Sales, 2017). These achievements, along with participants' reflections, provide evidence of the participants' high expectations of themselves and their ability to meet those expectations.

It should be noted that participants in the current study were an advantaged group within the overall population of individuals who are DHH, and the results reported here may not be generalizable to all individuals of similar ages who were identified with hearing loss during early childhood. Because parents of participants found and chose the Moog Center for their children, they may have been more heavily invested in their children's education than other parents. The Moog Center provided a strong parent component for guiding, educating, and empowering parents in ways to support their children in learning to talk. Parents were supported and guided through transition to general education. Parents of the teens and young adults in this study were also more highly educated than is typical, with 78% of mothers being college educated. In addition, the mean IQ of the participants were all within the normal range, and 52% were above average.

The fact that all participants in this study attended a single program means that results are easier to interpret because all of the children had reasonably similar educational experiences during the early childhood period. At the same time, the absence of children from other programs or who were not in any program (i.e., a control group) means that we do not know whether these very positive outcomes can be attributed to this particular program or to other factors that were not measured such as family background or parent motivation.

For parents of children who have recently been identified as DHH, these results make it clear that children who are DHH can have very high levels of achievement with respect to educational, employment, communication, and related outcomes. In fact, their achievement can be on the same level as their peers with typical hearing. EHDI providers and educators working with young children who are DHH can use the results from this study, to inform parents of what is possible, as well as to calibrate their own expectations about what children who are DHH are able to achieve.

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Appendix A
Sample Schedules and Rationale

Sample Preschool Morning Schedule with Individual Children Represented by Alphabet Letters

Time	*Teacher 1*	*Teacher 2*	*Teacher 3*	*Teacher 4*	*Discovery Room, Teacher 5*
8:25 – 8:30 Device Check	A, B, C, D	E, F, G, H	I, J, K, L	M, N, O, P	
8:30 – 9:00 Syntax/Vocab	A, B	E, F	I, J	M, N	Circle, Choice C, D, G, H, K, L, O, P
9:00 – 9:30 Syntax/Vocab	C, D	G, H	K, L	O, P	Circle, Choice A, B, E, F, I, J, M, N
9:30 – 10:00 Speech/Aud. Skill	A, B	E, F	I, J	M, N	Music/Movement C, D, G, H, K, L, O, P
10:00-10:10 Snack	A, B, C, D	E, F, G, H	I, J, K, L	M, N, O, P	
10:10-10:30 Recess	Staff time	Staff time	Staff time	Staff time	Recess ALL students
10:30 – 11:00 Speech/Aud. Skill	C, D	G, H	K, L	O, P	Music/Movement A, B, E, F, I, J, M, N
11:00-11:30 Conv. Lang	A, E	B, I	F, J	M, N	Thematic Art C, D, G, H, K, L, O, P
11:30-12:00 Conv. Lang	C, G	D, K	H, L	O, P	Thematic Art A, B, E, F, I, J, M, N

Note. Sample schedules are provided here to help the reader understand the reasoning behind the development of these schedules. The daily schedule was organized to provide opportunities for the continuum of teaching activities from structured lessons to conversational activities. At one end of the continuum is teaching within a lesson, using repetitive, structured activities to practice specific language targets. Further along the continuum is teaching within contrived conversational activities which are designed by the teacher to obligate use of a variety of structures for practice in the context of naturally communicative interactions. At the far end of the continuum is teaching during spontaneous exchanges as the teacher capitalizes on a child's spontaneous language during all communicative interactions throughout the day to help the child improve his or her language.

The framework of the schedule provided opportunities for this continuum of teaching activities from lessons to spontaneous conversation. Children were organized in small groups of two or three for focused spoken language instruction (i.e., syntax, vocabulary, language, speech, and auditory [aud.] skill development). Small groups ensured that the teacher could know precisely each child's skills and could individualize instruction for maximum challenge and maximum success. The larger groups provided opportunities for transferring learned skills to a variety of natural situations and for a variety of purposes. The afternoon schedule for preschool children included instruction in early math, reading readiness, hands-on language experiences, and cognitive activities.

Sample Elementary Morning Schedule with Individual Children Represented By Alphabet Letters

Time	*Teacher 1*	*Teacher 2*	*Teacher 3*	*Teacher 4*	*Learning Center, Teacher 5*
8:25 – 8:30 Device Check	Q, R, S, T	U, V, W, X	Y, Z, AA, BB	CC, DD, EE, FF	
8:30 – 9:00 Reading	Q, R	U, V	Y, Z	CC, DD	Special Activities S, T, W, X, Y, Z, CC, DD
9:00 – 9:30 Reading	S, T	W, X	AA, BB	EE, FF	Special Activities Q, R, U, V, AA, BB, EE, FF
9:30 – 10:00 Speech/Aud. Skill	Q, R	U, V	Y, Z	CC, DD	Critical Thinking S, T, W, X, Y, Z, CC, DD
10:00 – 10:30 Speech/Aud. Skill	S, T	W, X	AA, BB	EE, FF	Critical Thinking Q, R, U, V, AA, BB, EE, FF
10:30-11:00 Phys. Ed/Recess	Staff time	Staff time	Staff time	Staff time	Phys. Ed/Recess ALL students
11:00-11:30 Language	Q, R	U, V	Y, Z	CC, DD	Computer S, T, W, X, Y, Z, CC, DD
11:30-12:00 Language	S, T	W, X	AA, BB	EE, FF	Computer Q, R, U, V, AA, BB, EE, FF

Note. In the elementary program, children were organized in small groups of two or three for focused spoken instruction in reading, speech and auditory (aud.) skill development, and language. Large groups included special activities, critical thinking, physical education, and computer. Special activities included Art, Social Skills, Theater Workshop, etc. provided on different days throughout the week. The afternoon schedule for this group of elementary school children was organized in groups of four for social studies, science, math, and written language.

For both preschool and elementary groups, all spoken language instruction was explicitly focused on specific objectives. The Moog Center schedules were designed to provide a balance for children, moving from periods of intense, explicit instruction in small groups to larger group activities in which children had opportunities for natural communicative interactions. The physical movement, alternating from space to space, from intense to less intense, and from small group to larger group activities, provided a good balance for children and enhanced learning.

Appendix B
Colleges and Universities Attended

Abilene Christian University
Arizona Christian University
Arizona State University (2)
Art Institute of Colorado
Art Institute of St. Louis
Baylor University
Bradley University
California State University Northridge (3)
Christian Life College
Fontbonne University
Gallaudet University
Grand Canyon State University
Lindenwood University
Longwood University
Missouri State University (2)
Multnomah University
National Institute for the Deaf
Pennsylvania State University
Purdue University
Rochester Institute of Technology (15)
Southeast Missouri State University
St. Louis University
Texas Woman's University
Trevecca Nazerene University
Trinity International University
University of Delaware
University of Denver
University of Illinois at Chicago
University of Miami
University of Minnesota Rochester
University of Missouri (2)
University of Toledo
University of Tulsa
Washington University in St. Louis
Yale University

Appendix C
Participants' noted awards, achievements, and club participation

Academic Awards: Honor Roll, High honor roll, JCAA Academic Scholarship, 4.0 GPA throughout entire schooling career, National Junior Honor Society, High School Scholastic Achievement Award, Academic Excellence Award, Cum Laude Society, Magna Cum Laude, Summa Cum Laude, Commended National Merit Scholar, A+ Program, Scholar Athlete award, high school commencement speaker, and valedictorian.

Athletic Achievements: Varsity letters in various sports, including baseball, basketball, track, dance, and volleyball; all conference champions, leadership positions and captain of teams, Eagle Scouts, Black Belt in Mixed Martial Arts, CPR certified, and First Aid certified.

Clubs: Student campus activities committee, student campus government, campus ambassadors, literary magazine, reading club, mission trip organizations, historic preservation club, random acts of kindness club, volunteer organizations, social fraternities and sororities, professional and business fraternities, service fraternities, Christian campus ministry organizations, peer educator organizations, professional and major organizations (School of Health Professions, American Advertising Federation, National Student Speech Language Hearing Association, Supply Chain Management Association, Future Farmers of America Lab Science Technology), deaf organizations (National Association of the Deaf, ASL Club, Sign Language Organization, Deaf club), leadership in organizations including events coordinator, secretary, treasurer, executive board member, and vice president roles.

Appendix D
Additional Verbatim Participant Reflections

Additional Young Adult responses to "What are you most proud of since you left the Moog Center?"

- "That I am able to be a part of the hearing world and be successful because I don't think I would have the opportunities I do if my parents hadn't gotten me a cochlear implant."
- "The fact that I know how to talk and most people do not even realize I'm deaf until I tell. I also love how I can be an inspiration to others (parents and kids) who have had the same concerns that my parents and I have had over the years."
- "Graduating from the #1 Journalism school in the country, with honors, and being accepted into that University's Masters' program."
- "Creating an anti-bullying lesson plan that is now taught throughout MN."
- "I am most proud of my independence since leaving the Moog Center. I have gone away to college and even studied abroad for a semester."
- "Making an entire career out of my passion for languages and getting people to pay me to do what I love."
- "Marriage of my wife and I, Bachelors' Degree, Current engineering position…continuing to progress in communicating with others."
- "The most proud moment was when I graduated with my Masters' degree in Deaf Education."
- "Participating fully in the hearing world, being able to speak clearly."
- "Getting an education and a job."
- "That I have managed to retain my speech and continued to use it in my daily life and at work."
- "My ability to excel in the classroom and be an actively involved member outside of the classroom…I work hard to get good grades while at the same time I am very social and involved in my community."
- "I would say the fact that I've been able to make the transition pretty seamlessly from the Moog environment to a normal hearing world and have been able to thrive."
- "My gymnastics career as well being able to communicate well with others!"
- "I can hear well, do well in school, have good speech and grammar. I have been fortunate to be able to succeed at whatever I wanted to try."
- "Finishing my degree at [X University] and found the perfect job at [X University]."

Additional Young Adult responses to "Please comment about anything else you would like to share with us."

- "My instructor told me for my EMT class that he didn't think I was going to be able to be certified by the state because of my hearing deficits…. Not only did I pass my class, I was one of the top of my class and more importantly, my program director who initially doubted me ended up defending and advocated for me to the [state] department of transportation saying that I was fully competent to be certified."
- "I am extremely thankful to the Moog Center for all the time and effort they put in me to help build my confidence and prepare me for the world."

- "Everything that I learned at Moog Center has been contributed to my success in the hearing world. Because of my confidence and determination, I am able to be successful in most things that I attempt."
- "I'm thankful for my time at the Moog Center. I don't know where I would be without your tireless teachers."
- "I am very proud that I can speak very well. I/O this to my cochlear implant, my audiologist, my teachers, my parents, and my own desire to learn to speak. I can't imagine how my life would be without my implant & if I couldn't speak. It was very hard for me to start talking and took forever for me to learn talk. My parents & Moog Center never gave up on me. I appreciate my parents & Moog Center. I strongly urge all new parents who have a child who is hard of hearing, please, don't give up trying make your child learn spoken words. Your child will thank you the rest of his or her life. I know that I do!"
- "I'm proud to have attended Moog School. Without them, I would never have as much success as I have lately. Good group of people and lifetime relationships."
- "Life is as good as you make it, you can be as miserable in the situation you are in, make the best of what you can, life will treat you well after you enjoy it."

Additional Teen responses to "What are you most proud of since you left the Moog Center?"

- "Being inducted into Cum Laude Society in my junior year."
- "Joining my Highschool Robotics team and building successful competitive robots."
- "I can hear well, do well in school, have good speech and grammar. I have been very fortunate to be able to succeed at whatever I wanted to try."
- "My ability to play an instrument at a very high level, which I plan to major in college."
- "Taking 5 AP classes, a math class at the local college and leading 75-member team practices senior year."
- "Proud of myself for developing more confidence in my Algebra skills. I struggle with Math. Proud of my family for not being too afraid to let me follow my dreams."
- "I am most proud of reaching the rank of Eagle Scout in Boy Scouts of America. It required me to plan, develop, and carry out a massive community project that required hundreds of hours of work on my part."
- "Success in school, AB honor roll, being able to play sports with hearing friends/teammates.
- I'm proud of achieving high grades, such as having a current 4.2 GPA. I'm fully confident of myself."
- "I'm most proud of myself. It took a lot of courage to meet new friends when I left the [Moog] community."

Additional Teen Responses to "Please comment about anything else you would like to share with us."

- "Thank you for everything that Moog has done for me from teaching me how to talk, to my implants, etc."
- "I have cheered at the loudest of basketball/football games with the rest of my cheerleading squad, I have set school records for pole vault, I have taken up playing the piano, and I even joined my school's diving team this last year."
- "Ever since I left the Moog all of us that went there are close like peas in a pod."
- "Thank you for giving me the experience and help that I needed so I could go on to regular hearing schools."
- "I would like to say that Moog is one of the greatest schools I have ever been to. I still tell my parents how I would love to work there."
- "I wouldn't be where I am today without Moog…it enabled me to become the successful and independent man I am today."

Appendix E
Modeling and Imitation

In interactions with the children throughout the day, teachers strive to help children increase their spoken language competence. Teachers listen not only to what a child says but also to how the child says it and then help the child say it better. This may be by including more words, adding new vocabulary, correcting grammar, increasing the complexity of the syntax, or improving the speech intelligibility. Once the child has succeeded in getting his or her idea across, it is important to help the student express that idea. However, at the Moog Center, teachers believe that it is important to help the child use higher levels of vocabulary and/or longer, more complete phrases and sentences. Teachers use the Modeling and Imitation strategy as a technique to facilitate and accelerate the child's learning. The words modeled by the teacher are based on both what the child means and what the child actually says. Here's how it works: (a) the child talks, (b) the teacher listens, (c) the teacher indicates she understands, (d) the teacher selects a target for improvement, (e) the teacher restates what the child has said and highlights the added target word(s) in her model, (f) the child imitates the teacher's model (Moog & Stein, 2008; Moog, Stein, Biedenstein, & Gustus, 2003).

Imitating the teacher's model and including the targeted aspect provides the child practice with producing improved language. Imitation is an essential step in the process as it provides practice using the syntactic structure, vocabulary word, or speech sound that was targeted in the model. In addition, imitation helps the child learn to recognize and

understand the new words or sounds the next time he or she hears them and helps the child's development of auditory memory.

A model given by a teacher may serve many purposes, such as correction, expansion, and/or completion. The following are examples of Modeling and Imitation:

Jack comes into class after recess.

Jack: I play tag Suzie!
Teacher: I played tag with Suzie.
Jack: I play tag with Suzie.
Teacher: I played tag with Suzie.
Jack: I played tag with Suzie.

The teacher and child are engaging in a language activity involving cutting and pasting. The teacher is holding a pair of scissors, which the child needs to complete the next step in the activity.

Child: Need scissors cut paper.
Teacher: I need scissors to cut…
Child: I need scissors cut paper.
Teacher: I need scissors to cut the paper.
Child: I need scissors to cut the paper.